

External Technical Review Summary

United States Department of Energy Office of Environmental Management (DOE-EM)

External Technical Review of the Demonstration Bulk Vitrification System (DBVS) for Low Activity Waste (LAW) at Hanford

Why DOE-EM Did This Review



The Department of Energy (DOE) is charged with the safe retrieval, treatment and disposal of 53 million gallons of Hanford radioactive waste. The Waste Treatment Plant (WTP) is being designed to treat and vitrify the High Level Waste (HLW) fraction in 20-25 years. The WTP is undersized for vitrifying the LAW fraction over the same time frame. The DOE is evaluating Bulk Vitrification as an alternative to increasing the size of the WTP LAW treatment process. Bulk vitrification is an in-container melting process where the LAW is mixed with soil and glass formers and melted in a 50 cubic yard roll-off container. At the time of this review (2006), laboratory and pilot scale testing was in progress and the DOE had contracted to construct a full scale unit. *The objective of this external review was to determine if, as designed, the DBVS (1) could meet the requirements defined in the system specification, (2) produce waste that meets the Hanford's Integrated Disposal Facility requirements, and (3) receive operational approval by DOE and other regulators.*

What the ETR Team Recommended

- Additional cold testing and demonstration is needed for process design and operations before radioactive testing begins (e.g. dried waste feed transfer, prevention of secondary phases, testing of prototypic waste compositions, closure of the technetium and cesium mass balance, testing and safety analysis of the melt-box containment).
- The Process Control Plan should be completed

and its effectiveness tested in the full demonstration.

- The mixer-dryer and off-gas systems need special attention in the next project phase since past work has focused on In-Container Vitrification™.
- System complexity should be reduced to enhance system operability and availability.
- A better understanding of the DBVS process chemistry is critical to success, both in ensuring reliability and in troubleshooting and recovering from process issues.
- Process sampling and monitoring plans should be improved to ensure that essential data is captured from the test runs.
- Potential nuclear safety issues, including confinement strategy, implementation of Integrated Safety Management, and response to off-normal events must be resolved before radioactive operation.
- The project needs to ensure that designs and specifications meet the required codes and standards.

What the ETR Team Found

The DOE requested this review in the early stages of the project which allowed for addressing issues found in the subsequent demonstration phases. No fatal flaws were identified at the current state of the project. However, 19 technical issues that could result in a failure of the DBVS to meet established performance requirements, 26 areas of concern which could result in a change to design or additional development, and 13 suggested improvements to enhance safety, cost, schedule or efficiency were identified. The DBVS Project has conducted extensive testing ranging from crucible melts of both simulants and radioactive wastes to engineering scale melts. At the time of the review, development and demonstration had focused on glass formulation and melter system testing and demonstration. The design of other major components and systems has largely relied on limited vendor testing.

To view the full ETR reports, please visit this web site:
<http://www.em.doe.gov/Pages/ExternalTechReviews.aspx>

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The purpose of an External Technical Review (ETR) is to reduce technical risk and uncertainty. ETRs provide pertinent information for DOE-EM to assess technical risk associated with projects and develop strategies for reducing the technical risk and to provide technical information needed to support critical project decisions. Technical risk reduction increases the probability of successful implementation of technical scope. In general, ETRs assesses technical bases, technology development, and technical risk identification and handling strategies.



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